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Herbert Friedmann
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October 18, 1963

Dr. Hildegarde Howard
Los Angeles County Museum
Exposition Park
Los Angeles, California

Dear Dr. Howard:

On Wednesday, November 6, 1963, the Los Angeles County Museum will dedicate and officially open its new Vertebrate Paleontology Facility. The ceremonies will take place in the new laboratories on the fourth floor, west wing, of the Museum at 10 A. M.

This letter is written to make more personal what would otherwise be a mere printed invitation. We of the staff hope that you may find it convenient and interesting to attend and to add to the occasion by your presence.

November 6 also marks the 50th anniversary of the opening of this Museum. That evening at 8:30, we shall have a special meeting highlighted by a lecture by Dr. E. H. Colbert, Chairman of the Department of Vertebrate Paleontology, of the American Museum of Natural History, New York, on "Little Dinosaurs from Ghost Ranch." Enclosed are two tickets for this lecture.

Sincerely yours,

Herbert Friedmann

THE MUSEUM ASSOCIATION OF THE LOS ANGELES COUNTY MUSEUM

Presents

MUSEUM NATURE SERIES

All of the speakers in this program are specialists in Nature Study and have worked as teachers or Ranger Naturalists.

LET'S EXPLORE THE FOOTHILLS

Presented by Paul W. Colburn

GEOGRAPHY

Literally, the foot of the mountains. The ridges and canyons from the floor of the great valleys, at various elevations beginning at 50-100 feet above sea level, extending to 5,000 feet elevation.

Typically, the entire Santa Monica Range from Griffith Park to Malibu, the Verdugos, the Sierra Madre of the San Gabriels, and the lower reaches of the Santa Ana and San Bernardino Ranges.

CLIMATE

Semi-arid, 10"-30" annual rainfall, often torrential type with rapid runoff. Temperatures: mean summer maxima 84-100°, winter minima 32-44°. Growth season limited to wet, coldest months (except in stream beds). Dormant season long (8 months), dry, hot!

LIFE ZONE -- Upper Sonoran to Transition

VEGETATION -- Characteristic of the foothills of southern California is the Chaparral, a broad, stiff-leaved type of growth 3 to 6 feet or 10 feet high, dense, often nearly impenetrable. Very subject to fire even in a green state. Most chaparral plants are, however, able to stump-sprout following a fire. Larger trees, 15-70 feet tall, are found in the foothills, principally in the canyons.

California Live Oak	Ceanothus (Lilac)	Chinquapin
California Black Walnut	Sumac	Sage
California Laurel	Manzanita	Sage Brush
Western Sycamore	Scurb Oak	Buckwheat
Canyon Live Oak	Greaswood	Coffee Berry
White Alder	Toyon	Monkey Flower
Cottonwood	Catalina Cherry	Yucca
Big-leaf Maple	Hollyleaf Cherry	Encelia
Willow	Yerba Santa	Fremontia
Digger Pine	Gooseberry	Poison Oak
Coulter Pine	Chamise	Grasses, Bulbs, Vines
Knob-cone Pine	Mt. Mahogany	Mushrooms

ANIMAL LIFE -- The density of shelter and variety of plant life assure abundance of animal life.

Insects

Beetles	Flies	Gall Insects
Bugs	Bees	Wood and Root Borers
Butterflies	Ants	Dragon Flies
Moths	Grasshoppers	

Other small animal life

Millipeds	Centipedes	Isopods (sowbugs)
Snails	Earthworms	Spiders
		Scorpions

Reptiles

Alligator Lizard	Two-banded Racer	Gopher Snake
Swift (lizard)	(snake)	Rattlesnake
	King Snake	

Birds

Bush-tit	House Finch	Woodpecker
Wren-tit	Goldfinch	Dove
Canyon Wren	Titmouse	Sparrow Hawk
Gnatcatcher	Warbler	Western Red-tail Hawk
Thrasher	Thrush	Cooper Hawk
Towhee	Flycatcher	Sharp-shin Hawk
Roadrunner	Hummingbird	Great Horned Owl
Scrub Jay	Kingbird	Turkey Vulture
Quail	Magpie	California Condor
Sparrows	Raven	

Many other species of birds come in during migration

Mammals

The California Grizzly, the largest grizzly bear in the world, once lived in the foothills of southern California, but was made extinct by the pioneers.

Mule Deer	Chaparral Mouse	Mountain Lion
Brush Rabbit	Deer Mouse	Bob Cat
Wood Rat	Meadow Mouse	Grey Fox
Pocket Gopher	Opossum	Coyote
Ground Squirrel	Shrew	Skunk
		Raccoon

MAN IN THE FOOTHILLS

The aborigines hunted and took a good living from the plants and animals of the foothill regions. "Mast" in the form of pine nuts, acorns, bulbs and roots, seeds and fruit were gathered in abundance and stored for between-season eating. Primitive weapons and snares were effective in capturing animals for food and clothing.

BIBLIOGRAPHY

Fultz	Elfin Forest of California	1927
Jepson	Manual of Flowering Plants of Southern California	1925
Munz	Botany	1935
Munz	California Plant Communities	1949
Peterson	A Field Guide to Western Birds	1941
Burt	A Field Guide to Mammals	1952

Los Angeles County Museum Publications

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LET'S EXPLORE THE RIVER BEDS

Presented by Mr. S. A. Karlin

The river beds of southern California with their associated streamside vegetations compose a special wildlife area. This area is the most popular home or habitat of the wild animals of the region. In the drier areas of southern California the river may disappear in part by flowing underground. Typical localities that may serve as examples are: Tujunga Wash near Hansen Dam, Santa Clara River, and San Gabriel River. Along these washes, the trees may be spaced in widely separated clumps. It is because of the shade and water that many animals usually found in other areas, will be seen here in the summer months.

List of plants and animals mentioned in the illustrated talk.

I. Common Plants.

A. Trees.

Western Sycamore	White Alder	Calif. Buckeye
Black Cottonwood	Calif. Walnut	Elderberry
Willows	Calif. Laurel or Bay	

B. Shrubs.

Mule Fat	Poison Oak	Calif. Wild Rose
Coyote Brush	Scale Broom	

C. Other Plants.

1. Rocky Stream-bank Ledges.

Stone-crops	Goldback Fern
Alum Root	Club Mosses

2. At the water's edge, occasionally submerged:

Cattails	Nettles	Columbine
Horsetails	Liverworts	Tules
Water Cress	Ferns	Sedges
Monkey Flowers		

3. Neighboring area in vicinity of river bed:

Poison Hemlock	Wild Honeysuckle Vine
Wild Cucumber	Woolly Blue Curls

II. Common Animals.

A. In the water:

Red Legged Frog	Pacific Newt	Rainbow Trout
Tree Frog	Garter Snake	Cat-fish
Worm Salamander	Crayfish	Aquatic Insects

B. In or near the stream banks:

Wood rats	Solitary Vireo	Mule Deer
Jack Rabbits	Flicker	Coyote
Beechy Ground Squirrel	Opossum	M'tn Lion
Valley Quail	Racoon	Gray Fox
Black Phoebe	Bob Cat	Red-Tailed Hawk

C. In the open washes, on the rocks and gravel:

Horned Lizard	Western Fence Lizard	Western Ring-neck Snake
Side-blotched Lizard	Red Racer	
Western Skink	Gopher Snake	Desert Tortoise
Whiptail	Calif. King Snake	Pacific Rattlesnake

Rocks of the washes.

The river bed contains samples of rock washed out of the mountains. Prospecting with a hammer and a shovel one may find a great variety of rocks and minerals.

I. Geology terms illustrated:
Pot Holes - How are they formed? How are they different from Indian mortar rocks?
Smoothed and rounded boulders - How did they get this way?
Natural Erosion - What is the work of rivers?
Strata - Why are rocks in layers? Which layer is the oldest?

II. Families of rocks:
Igneous - Rocks which were once melted, and hardened as they cooled.
Granite - Visible minerals are quartz, feldspar, and mica.
Basalt - Minerals are not visible.
Sedimentary - Rocks that were formed from sediments.
Sandstone
Puddingstone
Shale
Metamorphic - Made-over rocks from other kinds by heat and pressure.
Serpentine
Geodes
Nodules

Activities leading to achievement awards:
1. Tracks and tracking: Plaster casts
2. Collecting rocks and minerals
3. Photography
4. Collecting and care of small live specimens
5. Plant press, and mounting plant specimens
6. Insect collection
7. Gall collection: of galls found on streamside plants

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LET'S EXPLORE THE PARKS
Presented by Richard Haas

A. What kind of parks do we have? What is a park?
   1. Parks with hills and canyons and streams
      a) Will Rogers State Park
      b) Griffith Park
   2. Parks on the ocean front
      a) Cabrillo State Park
   3. Small parks with lawns and trees (small city parks
      a) local city parks
      b) playgrounds
   4. Special Parks
      a) Hancock Park
      b) Exposition Park, Rose Gardens
      c) UCLA Botanical Gardens
   5. National and State Parks
      a) Yosemite - California
      b) Yellowstone - Wyoming
      c) Big Sur - California
      d) Everglades - Florida
      e) Many, many others

B. What if I can't go to a park?
   1. Backyard exploration
      a) insects and their relatives
      b) introduced plants
      c) birds
      d) weeds
   2. Trees planted along streets
      a) Cabob
      b) Gum trees
      c) Palms -- "Feather" Palms, "Fan" Palms
      d) Introduced deciduous trees
      e) Shrubs - native and introduced
      f) Street trees as homes for birds and small animals

C. What can I see and learn about the parks and backyards?
   1. How plants and animals depend on each other.
   2. How many different kinds of living things live within the city.
   3. Some plants and animals are numerous, others rare. Why?
   4. What plants and animals are native, which introduced.
      a) Why are there so many kinds of introduced plants?
   5. How the living things we see are able to live among humans. How they are suited for their environment.

D. What do I need in order to explore our parks and backyards?
   1. Basic equipment
      a) good eyes, or ears, or nose or all three.
      b) notebook and pencil
      c) a book about the kind of living thing you wish to learn about, or
      d) a book about rocks that you may find.

2. Special equipment for special ways of observing.
   a) Camera
   b) Insect equipment
      1. net
      2. killing and relaxing jars
      3. spreading board
      4. a box for mounting specimens
   c) Nets and jars for aquatic specimens
   d) Dress - shoes etc., depending on park explored
   e) Plant equipment
      1. knife or strong scissors
      2. press
      3. paper for mounting
   f) Reptile equipment
      1. noose
      2. cloth sacks
   g) Microscope for small aquatic specimens
   h) Small magnifying glass for "close ups"
   i) Colored pencils, paper for drawings
   j) Best equipment - good eyes and good senses.

E. What must I do while exploring in order that I stay a good "park citizen"?
   1. Do not tear out plants by roots
   2. Do not cut specially planted flowers or rare wild ones.
   3. Do not kill any animals big or small except perhaps the insects you may collect.
      a) What are dangerous animals and plants?
         1. Black Widow - painful bite, few deaths, none in healthy adults
         2. Tarantula - not dangerous, bites only if badly teased, as bad as bee sting
         3. Rattlesnake - only poisonous snake in California
         4. No poisonous lizards
         5. Poison Oak
   4. No collecting at all in state parks.
   5. Replace all stones, logs, etc.
   6. Remember the reason for parks and our responsibilities as as citizens.

F. Can I keep alive any animals I find in a park or backyard in order to observe it?
   1. How to make inexpensive cages for small animals
      a) garbage can wire cage
      b) apple box cage
      c) old aquariums
      d) milk carton cages for insects
   2. Food
      a) try to watch to see what they eat in wild
      b) catch insects or worms or buy meal worms in a bait store

G. Where can I get help if I want to work on a project?
   1. Booklets from the museum
   2. Books from school library
      a) card catalogue
      b) librarian
   3. Science Teacher
   4. Park supervisor or other park worker

H. Suggested texts for group leaders
   1. Field Book of Nature Activities, Wm. Hillcourt. 1950
   2. Field Book of Snakes, Field Book of Western Birds, etc. by G.P. Putnam & Sons, N.Y.
   3. Museum publications are handy, inexpensive guides to identification of local plants and animals.

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LET'S EXPLORE THE SEASHORE

Presented by John Cunningham

The sea is not only the cradle of life but is today the greatest reservoir of life itself. Many groups of animals common at the seashore are either poorly represented or entirely absent from dry land. Other groups, such as insects, are not found in a true marine habitat. Plant life is colorful and varied, consisting mainly of kelp.

The sea is very big, covering 70 percent of the earth's surface. It is also very deep, reaching a depth of more than 35,000 feet. The sea is continuous, not separated as are land and fresh-water habitats. Temperature, salinity (saltiness), and depth, however, prevent the free movement of marine organisms.

Without specialized and expensive equipment it is difficult for the average person to study sea life other than that found near the shore. However, most of the plant and animal life of the sea is found in the shoreward zones. There they are greatly influenced by the actions of the tides, produced by the pull of the moon and sun. Since tides have a periodicity of about 12½ hours, high tides occur in most localities twice daily. The best time to study sea life is during a very low tide known as a minus tide.

The intertidal zone is the area between the high and low tides. Here, the greatest concentration of life exists. It can be roughly divided into three groups: (1) That which is found at the upper limit of the intertidal zone and is largely exposed to the air; (2) That in the middle zone which is alternately exposed to the air and under water; and, (3) The lower zone, and in the tide pools, where organisms are largely submerged.

High on the beach we may find gulls and other sea birds resting. In rocky areas we may find sea lions and seals sleeping. Brown pelicans and cormorants also spend a great deal of time sitting on exposed rocks. Swimming and diving in the vicinity of rocky areas we may see grebes.

Frequently we find deep water animals washed ashore, such as rays, sharks, and occasionally even whales. The jelly-fish Vellella is sometimes washed ashore in tremendous numbers. Digging in the sand we can collect the interesting sand crabs. As we sift the sand we can find sand dollars and shellfish. Frequently, however, such shells are very worn and in order to get shiny examples we must collect the living animals. Shellfish, or molluscs, such as the mussel that have

two parts to their shell are known as bivalves. Those with only one part, such as the limpet, are called univalves. The chitons have eight parts to their shells. Barnacles may look like shellfish but they are actually more closely related to such crustaceans as the rock crab. The shells of the tube worms often form intricate designs on the rocks.

In the tide pools we find many interesting plants and animals. Although it has the name of a plant, the sea anemone is actually an animal, as are the colorful encrusting sponges that we find on the rocks. The sea urchins have sharp spines for protection. Most shellfish have a small door to protect them from their enemies but after they die the hermit crabs use the shell for shelter. On rocks we may find the abalone. Many of these shellfish and other marine organisms are protected by the law so we should inquire about minimum sizes, bag limits, and closed seasons. Occasionally in the tide pools we find small fish, such as the sculpin. The sea hare may protect itself by sending out a "smoke screen." The octopus has strong suction cups on its tentacles and can change its color to match its background.

Seaweeds can be collected and preserved like other plants by pressing them. Living shellfish may be killed by placing them in boiling water. The animals may then be removed with tweezers. Soft bodied animals may be best preserved by putting them in formaldehyde (10% solution) or alcohol. Overcollecting should be avoided and it is important that we leave the area just as we found it. This means replacing every boulder that we turn over.

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LET'S EXPLORE THE MOUNTAINS

Presented by Glenn B. Coy

I. Many factors influence the occurrence of plants and animals in our mountains at any given elevation. Some of these may be exposure to sun, moisture, depth of the soil, and prevailing temperature.

II. As one rises in elevation he notices changes in life can be likened to geographic areas to the north and south. These are grouped into belts called life-zones.

III. Lower Sonoran Zone -- Sea level to 500 ft.
Grasslands and scattered oaks

IV. Upper Sonoran Zone -- 500 - 4000 ft.
Chaparral, or brushland, of the foothills

V. Transition Zone -- Approximately 4000 - 7000 ft.
A. This zone contains plants and animals from adjacent areas. It is in the lower snow-line zone. It includes one of the two principal tree areas in our mountains.

B. Trees

Incense Cedar	Canyon Live Oak	Black Cottonwood
White Fir	Big Leaf Maple	Black Oak
Ponderosa Pine	White Alder	Sequoia
Sugar Pine		

C. Wild flowers and flowering shrubs

White Yarrow	Western Dogwood	Columbine
Shooting Star	Golden Rod	Larkspur
Paint Brush	Mountain Lilac	Mountain Misery
Blue Elderberry	Wyethia	Shooting Star
Lupine	Monkey Flower	Cow Parsnip
Wall Flower	California Buckeye	Showy Milkweed
Godetia	Leopard Lily	Yerba Santa
Fremontia or Flannel Bush		

D. Birds

White-headed Woodpecker	Robin	White-breasted Nuthatch
Red-shafted Flicker	Steller Jay	Western Tanager
Red-breasted Sapsucker	Audubon Warbler	Black-headed Grosbeak
Hairy Woodpecker	Hermit Warbler	Calif. Purple Finch
Downy Woodpecker	Canyon Wren	Pileolated Warbler
Western Wood Pewee	Creeper	Water Ouzel or Dipper
Olive-sided Flycatcher	Fox Sparrow	Violet-green Swallow
Mountain Chickadee	Junco	Black Swift

E. Mammals

Gray Squirrel	Coyote	Gray Fox
Chickaree	Spotted Skunk	Black Bear
Chipmunk	Striped Skunk	Raccoon
Calif. Ground Squirrel	Weasel	Mule Deer
Golden Mantled Ground Squirrel		

VI. Canadian Life Zone -- 7000 - 9000 ft.

A. This zone is typified by the Red Fir and the Jeffrey Pine. It is also a major forest area.

B. Trees

Red Fir Jeffrey Pine Western White Pine Lodgepole Pine

C. Mammals

Porcupine Mountain Pocket Gopher Mountain Coyote
Marmot Pine Martin

D. Birds

Sooty Grouse Mountain Quail Goshawk
Calliope Hummingbird Red-breasted Sapsucker

E. Reptiles and Amphibians

Alligator Lizard Garter Snake Rubber Snake
Mountain King Snake Swift or Blue-bellied Lizard

F. Wildflowers and Shrubs

Choke-Cherry	Pussy-paws	Corn Lily
Newberry Penstemon	Manzanita	Snow Plant
Bitter Cherry	Chinquapin	Fireweed
Small Leopard Lily	Camass	

VII. Hudsonian -- 9000 - 11,500 ft.

A. Here the forest thins out. Many shrubs are found, with trees only occasionally at the upper limits. Very little of this zone in southern California.

B. Trees

Whitebark Pine Lodgepole Pine Foxtail Pine Sierra Juniper

C. Flowers and Shrubs

White Heather Red Heather Gentian Labrador Tea
Sulphur-flower Red Elderberry Pine-mat Manzanita

D. Mammals

Pika Bighorn Sheep Red Fox

E. Birds

Clark Nutcracker White-crowned Sparrow Golden Eagle
Red-tailed Hawk

F. Reptiles and Amphibians

Yellow-legged Frog Yosemite Toad

VIII. Arctic-Alpine -- above 11,500 ft. (timber-line)

A. None in southern California. Due to short season between spring thaw and fall snow, no trees can grow. Soil is shallow. Animals scarce because of scarcity of food.

Presenting Nature to Groups

1- Qualifications of a Nature leader:
   A. Enjoyment and "at-homeness" in the out-of-doors.
   B. Enthusiasm, curiosity, and willingness to learn.
   C. Strong belief that it is worthwhile.
2- Why present Nature to children?
   A. Healthy outdoor activity.
   B. Exciting adventure.
   C. Security and realization of law and order in universe.
   D. Results many times in life time hobby or career.
3- How to present and stimulate interest in Nature:
   A. Use Nature's trick of camouflage, starting with Nature Games.
   B. Nature Crafts.
4- Have a reason for any Nature group project:
   A. Co-relate your particular organization's requirements for Nature work using reference books to assist in necessary identifications.
   B. Take walks to collect materials for craft work.
   C. When making leaf prints, have some actual use or reason for making them.
   D. Take field trips to beach for observation of marine life in tide pools and for shell collections and crafts.
   E. Field trips to mountains for craft materials and unusual rocks, roots and branches for flower arrangements and make entries at an annual flower show.
   F. Field trips to observe seasonal changes. Lake Arrowhead area has brilliant fall coloring in October.
   G. Have Star parties on clear moonless nights.
   H. Make feeding trays, cups and pine cone feeders for birds.
   I. When interest in birds is stimulated, take them to a sanctuary or bird walk.
   J. While resting on a hike, have a contest to find bark and roots or branches that suggest something they can perfect in shape with a bit of carving.
   K. Make a large specimen cage and have a Wild Game Hunt for insects, lizards, etc. for observation. Boys particularly like this project.
   L. Make star projector by punching holes in bottom of oatmeal box to show star constellation. Put flash light or bulb in and project stars on ceiling of a dark room. Myths about the constellation will add interest.
   M. Lay Nature treasure trails for surprise treats or just for fun.
   N. On a hike, give each person a "nature" name and have them observe and tell something about it while resting after lunch or at an evening camp fire if at camp. Older children enjoy using scientific names.
   O. Use Nature riddles for fun on your trips.
   P. Make plaster casts of animal and bird tracks.
5- Nature Programs at Camp:
   A. Keep tests and ranks voluntary and subsidiary to the general program.
   B. Allow for different individual interests.
   C. If your Camp procedure is to schedule set Nature Hikes, try calling them Explorations or Big Game Hunts or Tracking expeditions for added zest.
   D. Stimulate interest by posting some nature question with a bit of mystery each day or some nature project that can be done anytime during the day on their free time such as Secret Number trail or a map showing where they may locate and identify an interesting specimen.
   E. Use a Nature Theme to stimulate interest, having a daily award for the finest specimen brought in each day.
   F. Last but not least - Whatever you do have FUN.

THE INSECT WORLD

M. Scott Lewis

There are believed to be about 2,000,000 species of insects in the world although there are usually not over 20,000 species to be found in any given locality.

The actual number of individuals is enormous. A single hive of bees may contain 40,000 inhabitants, while large ant colonies run as high as a half million. Over 24,000 aphids have been counted on a single tomato plant. The total insect population of an acre of land may run anywhere from 1,000,000 to 35,000,000 individuals.

The reproductive capacity of insects is almost beyond belief. A queen honey bee may lay from 2,000 to 3,000 eggs a day, and the queen termite is able to lay 60 per second until several million have been laid. If the progeny of a single female aphid all lived, at the end of the year they would have the bulk and weight of the total population of China. Talk about giving birth to twins! In one species of parasites a single egg has been known to split up and produce as many as 2,500 individuals.

Under natural conditions a balance is established that keeps any species from becoming too destructive. Man's trouble arises from the fact that he has made changes that greatly increase the food supply of certain insects without increasing the number of their natural enemies.

SLIDES

Silverfish -- Example of the most primitive type of insect.

Orthoptera -- Various slides showing grasshoppers, katydids, common cricket and Jerusalem cricket. Members of this order are very destructive and have been known to destroy 15,000 acres of crops in 8 hours. Fortunately no less than 53 different birds feed upon them. The outer part of the body consists of a substance known as chitin that is shatter proof and even resistant to chemicals. Grasshoppers are very strong for their size and can often jump 75 to 100 times their length.

Odonata -- Dragonflies. Very beneficial insects because of their fondness for a diet of mosquitoes and flies.

Diptera -- Order of the flies and mosquitoes. Distinguished by the fact that they only have two wings. The most dangerous group of insects to man because of the way in which they spread disease.

Homoptera -- Sucking insects. Breed with great rapidity and difficult to control because not affected by ordinary poisons.

Coleoptera -- The beetles. The largest group of insects. Characterised by horny outer wings which are not used in flight.

Hymenoptera -- Ants and bees. Bees are largely beneficial and agriculture is quite dependent on them.

Lepidoptera -- Moths and butterflies. Many moths are destructive but few butterflies do any harm.

For a general discussion of the subject see:

General Entomology - by Frost, or any of dozens of modern works.

Field Book of Insects - by Lutz - will help with the identification.

The Moth Book, and The Butterfly Book - by Holland are standard references for the Lepidoptera.

LIFE ZONES OF CALIFORNIA

M. V. Hood.

These notes concern names and terms used in a lecture on the Life Zone Concept. They are for the use of listeners who are referred to the works of Drs. Grinnell and Hall, University of California, for a detailed discussion.

Life Zones are useful in the study of the distribution of plants and animals. When a student has learned to recognize some of the "zone markers", he can identify other species indigenous to the same zone.

There are three Life Regions in North America, namely the Tropic, the Austral, the Boreal. Life Zones are the subdivisions of Life Regions. In California, the Tropic Region does not occur, but three Life Zones are recognized in both the Austral and Boreal Regions as follows:

Austral: Lower Sonoran, Upper Sonoran, & Transition
Boreal: Canadian, Hudsonian, & Alpine-Arctic.

Latitude, Elevation, Climate, and Drainage determine Life Zones. Many times they are changed by fire, irrigation or clearing of land. In California, all six Life Zones may be observed in the center section of the Sierra Nevada Mts., from the Lower Sonoran semi-arid desert, to the Alpine-Arctic peaks. In the Southern section, the three higher zones tend to merge, and it is better to treat them as Boreal.

Life Zones are not bounded by straight horizontal lines, they follow the climate. For example, cold air flowing down a canyon or stream bed may create a tongue of Canadian Zone deep into the Transition, or a warm southerly exposure may thrust a lower zone well up into a higher zone.

Each Life Zone has its own peculiar assemblage of plant and animal life. Those species that breed regularly, and are largely restricted to a zone, are known as Index Species or Zone Markers.

AUSTRAL REGION

LOWER SONORAN ZONE ---- alt. 0 to 500 ft. rainfall 0 to 5 in.

Plants are adapted to a hot dry climate; i.e. they may have condensed bodies, reduced or fleshy leaves, a resinous or wooly covering, or a very short life cycle. Trees are found only near streams. Animals are mostly nocturnal or crepuscular.

Index Species:

Plants: Fan Palm, Palo Verde, Ocotillo, Desert Lily.
Amphibians: Desert Toad.
Reptiles: Desert Tortoise, Chuckwalla, Sand Lizard, Sidewinder.
Birds: Gambel's Quail, Dwarf Cowbird, Gila Woodpecker, Desert Sparrow.
Mammals: Pallid Bat, Kit Fox, Round-tailed Ground Squirrel, Desert Bighorn Sheep.

UPPER SONORAN ZONE ---- alt. 1,000 to 4,000 ft. rainfall ...to ... in.

Hero plants must adapt themselves to the long dry summer and fall. This is achieved by small vertically placed leaves, thick bark, dense wood, or small flowers and seeds. Typical ground cover is open grassy land with scattered trees, or thick brush known as chaparral.

Index Species:

Plants: Buckeye, Digger Pine, Poison Oak, White Sage.
Amphibians: Tree Salamander, Calif. Red-legged Frog, Canyon Toad.
Reptiles: San Diego Aligator Lizard, Calif. King Snake, Two-lined Racer.
Birds: Calif. Quail, Nuttall's Woodpecker, Calif. Jay, Brown Towhee, Wren-tit.
Mammals: Gray Fox, Calif. Leaf-nosed Bat, Black-tailed Jack Rabbit.

TRANSITION ZONE: ---- alt. 2,000 to 5,000 ft. rainfall 25 to 35 in.
This Zone includes the main forest belt, and contains the greatest number of species of trees and shrubs. It is subdivided into Arid, Humid, Sierra, and Redwood (Coastal) Transition.

Index Species:

Plants: Western Yellow Pine, White Fir, Snow Plant, Cone Flower.
Amphibians: Yellow-spotted Salamander, Cloudy Salamander.
Reptiles: Rubber Snake, Mountain King Snake, Sharp-tailed Snake.
Birds: Band-tailed Pigeon, Sierra Yellow-bellied Sapsucker, Vaux Swift, Pygmy Nuthatch.
Mammals: Shrew Mole, Silver-haired Bat, Yosemite Pocket Gopher, Grey Squirrel.

BOREAL REGION

In the following paragraphs, when a specie name is followed by a letter in parentheses, that specie is also found in the zone indicated by the letter. This apparent inconsistancy may be due to the latitude, then that specie cannot be considered as entirely reliable, and other factors must be relied upon for help.

CANADIAN ZONE ---- alt. 500 to 7,000 ft. rainfall 40 to 50 in.

This Zone is often poorly defined in California, it is the Zone of the Red Fir and Jeffrey Pine.

Index Species:

Plants: Silver Pine, Lodgepole Pine, Lewis's Mimulus, Monk's Hood.
Amphibians: Sierra Yellow-legged Frog,(H)
Reptiles: Tenaya Blue-bellied Lizard, Sierra Alligator Lizard.
Birds: Williamson's Sapsucker, Evening Grosbeak, Red-breasted Nuthatch, Green-tailed Towhee.
Mammals: Sierra Pine Martin, Porcupine (T), Sierra Mountain Beaver, Tahoe Chipmunk.

HUDSONIAN ZONE ---- alt. 7,000 to 9,000 ft. rainfall 50 to 55 in.

The lower border of this Zone is often very indefinite, the upper border is clear, as it is Timberline.

Index Species:

Plants: Mountain Hemlock, White-bark Pine, Rock-fringe, Cassiope.
Amphibians: Mount Lyell Salamander, Yosemite Toad (C).
Reptiles: .....
Birds: Arctic Three-toed Woodpecker, Clark's Crow, California Pine Grosbeak.
Mammals: Sierra Nevada Wolverine, Alpine Chipmunk, Belding Ground Squirrel.

ALPINE-ARCTIC ZONE ---- alt. 8,000 to 14,500 ft. rainfall 60 to 70 in.

Here plants adapt themselves to the long cold winters by means similar to those used by the desert plants, i.e. hairy coverings, squat growth, small leaves. There are no trees.

Index Species:

Plants: Alpine Sorrel, Sky-pilot, Alpine Marigold, Davidson's Penstemon.
Amphibians: Mount Lyell Salamander (H).
Reptiles: .....
Birds: Sierra Nevada Rosy Finch.
Mammals: Conyor Pika (H), Yellow Bellied Marmot (H) (C) Alpine Chipmunk (H).

SEA LIFE ALONG OUR BEACHES

Prepared for Natural History Course for Youth Leaders
by Mrs. C. H. Linsley.

In order that this study may not be too complicated for young people to learn and enjoy, I shall, for the most part, consider only three groups of animals.

1. Echinoderms, or spiny-skinned animals, such as starfish, sea urchins and sand dollars.
2. Mollusks, or footed animals, such as clams, snails and chitons. Most of these belong to two classes:
   a. Bivalves - shells having two similar parts, such as clams and oysters.
   b. Univalves - shells having only one piece, such as snails.

THE BEST TIME TO STUDY SEA LIFE is at low tide, preferably in the early morning, since many animals seem to feed at that time, and others are sensitive to light and hide during the daytime. Students should be prepared to wade into tide pools, but their feet should be protected form the rocks by shoes.

WHERE TO FIND SEA LIFE, AND SOME KINDS COMMONLY FOUND:

1. Sandy shores - many kinds of clams, sand dollars, and frequently sand starfish.
2. Mud flat areas or bay shores - California horn shells, bubble shells, chiones, slipper shells, macomas, and circular pecten or scallop.
3. Gravel areas washed up by the tides may contain dead specimens of many shells, such as cowries, coffee bean shells, hoof shells, limpets.
4. Rocky shores - live specimens of littorines, limpets, top or turban shells, and chitons.
5. Tide pools - top shells, hermit crabs (in the empty shells of other animals), sea anemones, sea urchins, sea hares, and many other univalves.
   Under the rocks in the tide pools one may find worms, some chitons, soft and brittle stars, nudibranchs and crabs. Brittle stars and other animals may be found in kelp holdfasts. Seaweed limpets and broad-eared pectens may be found attached to seaweed. Hidden under rocks or seaweed, one may find octopus.
6. Open shore - Starfish, sea urchins, sea anemones, mussels and barnacles may be found on the rocks where they are out of water only at low tide. On the rocks that are still under water, one may find abalones, cowries, rock shells, and purple-hinged scallops. Lobsters are ocassionally found in this locality. Norris top shells are usually found on seaweed along the open shore, or in large, deep tide pools.
7. Piddock and other rock-dwelling animals may be found along rocky shores embedded in rock or very solid soil.

CONSERVATION. Encourage young students to be aware of conservation in their study of shore life. They should be familiar with laws governing certain varieties such as pismo clams, abalones, and lobsters. They should be encouraged to spend much time studying live specimens at the shore, and to collect largely dead specimens. They should leave the homes of these animals as nearly like they found them as possible, as some will die if they lose their homes.

PRESERVATION. Live specimens of sea pansies, sea palms, and a few others may be kept for several days for laboratory study, if they are allowed plenty of space and changes of fresh, clean sea water. Many kinds may be carried home in fresh sea water and then preserved. As a rule, small specimens transport better and preserve more easily. Starfish and shore crabs may be brought home in a box of damp seaweed.

Starfish and sea urchins may be soaked for a few days in a formaldehyde solution and then dried.

Crabs are best preserved in a mixture of ethyl alcohol, glycerin and formaldehyde, and then allowed to dry. Specimens are of better color if they are dried in the shade.

CLEANING. Snail type animals and clams may be removed from the shells by boiling a very short while, and removing the soft parts with forceps or knife. Hermit crabs will usually crawl out of the shell if left over night in fresh water.

Chitons should not be boiled, but should be tied down to a flat surface as soon as captured in order to prevent curling. The flesh may be cut out after the animal is dead and the shell tied down again until completely dry.

LABELING. Specimens should be labeled with the date, and the place found, as this is sometimes very important in the identification.

REFERENCE BOOKS FOR STUDY:

Seashore Animals of the Pacific Coast - Johnson & Snook.
West Coast Shells - Keep & Baily
Between Pacific Tides - Ricketts & Calvin
Animals Without Backbones - Buchsbaum

To make a Track Collection

M.V.Hood

Find a good clear track, preferably in clay, clear away twigs etc, without disturbing the track itself. Build a small wall of mud or use a strip of cardboard (milk cartons make good strips ready greased) around track. Mix plaster of Paris as follows: Put cold water in a clean tin can or bowl, sprinkle plaster into water slowly and evenly until all free water disappears, when all dry plaster is absorbed stir gently, this avoids air bubbles and lumps in the mixture. Pour into track at side, not into track itself, this pushes the air out and fills all crevises. Allow to set at least half an hour. Pick up and carry home. Next day wash and clean up. Write data on back with indelible pencil.

To make a caste from the field-pattern:-

Coat pattern with soap, softenned in hot water, wrap fresh cardboard or metal strip around track and pour in plaster, leave to dry well, seperate, color as desired. Do not use green, tracks are not found in grass, two tones of brown are suggested. This method has one big disadvantage, you may break your original cast when seperating them, so we suggest that you make a working cast at home.

Take some clay and press your field cast into it, then smooth up the surface, touch up imperfections and build up clay to any desired size. Put collar around track. These should be made in three standard sizes so that the collection may "look well". Pour plaster, when plaster is well set and before clay hardens the track can be removed and can always be made again if it should be broken.

For further data on this intriging hobby see:

Jaeger..."Tracks and Trailcraft"

Mason.... "Animal Tracks" & "Animal Homes"

Seton ... " Lives of Game Animals"

Rowlands.." Cache Lake Country."

WILDERNESS SURVIVAL

Some devises used for protection.
Outline for a lectore, by M. V. Hood.

1. ENVIRONMENT AND RESPONSE

In any given environment, animals must learn to live, and to breed in sufficient numbers to survive. This is accomplished by the race, not the individual. As conditions do not remain the same throughout the year, the animals can:- migrate, store up food, hibernate, or pass the unfavorable season as an egg, chrysalis, etc.

2. PHYSICAL MAKE-UP

a. Senses: Hearing, bats; Sight, birds, etc; Smell, fox, etc; Touch, snail, sea anemone.
b. Body Covering: Scales, Feathers, Fur, Thick Skin, Spines, Shell -as of Tortoise, or Crab.
c. Changing Colors: Pigment "rearrangement"-frog, chameleon. Fur or Feather Change -Snow-shoe Rabbit, Weasle, Ptarmigan.
d. Secretions: Cover of foreign objects, -Caddis Fly, and Creosote Bag-worm.
e. Camouflage:
Protective Resamblance: Measuring worm, Katydid.
Shape:-no shadow cast, Horned Lizard.
Confusing, or disrupting color pattern: Killdeer, Plovers.
Constructive shading: Tomato Sphinx Caterpillar.
f. Weapons: Horns, Antlers, Claws, Pinchers, Beaks, Teeth.
g. Excretions:
Poison: Teeth, - Rattlesnake.
Stinger, - Scorpion, Wasps, etc.
Gas Attack: Skunk, Meloides Beetle.
Secretion: Toads, Garter Snake.
Smoke-screen: Octopus, Squid, Sea Hare.
h. Threats: Menacing sound, Menacing position, Bright colors, Deceptive colors.
i. Locomotion: Running, Flying, Jumping, Dodging, Swimming, Diving, Climbing, Gliding.
j. Special Devises: Trance, Sacrifice, Inflation, Comminity Life.
k. Next Generation: Must have: Safety, Food, Training, Guarding.

3. ENTER MAN:

Change of environment: Drainage, Fire, Flood, Clearing.

Restorative Steps: Sanctuaries, Refuges, Education, and Appreciation.

4. REFERENCE MATERIAL:

"How Animals Protect Themselves", Hadsell. Science Outline Series. Sacramento.
"Natural History Background of Camouflage", Herbert Friedman. Smithsonian, 1942.

SOME NOTES ON WHAT BIRDS EAT AND HOW IT AFFECTS MAN. Prepared by Mary V. Hood

These notes are very general. Many birds eat more than one kind of food. Still it is true that certain birds are classed as insect eaters, seed eaters, etc. The shape of the bill shows how it is suited to the chief food of the bird. Many seed-eating birds feed their nestlings on insects and worms. We think of woodpeckers as hunting for insects on the trunks of trees, but the Red-shafted Flicker (which is a woodpecker) sits beside an ant-hill and feeds on his principal diet,- ants. He may eat as many as 5,000 at a single meal. The California Woodpecker stores acorns in the bark of trees. Sometimes these acorns make up 80% of his diet. At other times he hunts insects on the trunks and branches of trees. Again he may be seen acting like a fly-catcher, darting out from a high perch after some passing insect. All this activity is of great help to man. If all birds disappeared suddenly, insects would eat up all the green things. This would be fatal for animals, including man, which depend, directly and indirectly, on plants and all would quickly starve to death.

BIRDS THAT EAT FISH

Pacific Loon	Double-crested Cormorant	Red-breasted Merganser
Red-throated Loon	Great Blue Heron	Bald Eagle
Eared Grebe	American Egret	Osprey
Western Grebe	Snow Egret	Forster's Tern
Pied-billed Grebe	Green Heron	Least Tern
White Pelican	Black-crowned Night Heron	Belted Kingfisher
Brown Pelican	American Merganser	

Many fishermen fear that these birds take too many fish, but careful study has shown that this is not true. Man likes to eat the deep-water fish of the sea; the birds tend to eat the surface feeders. Kingfishers eat suckers which man seldom bothers to catch; hence this bird helps prevent suckers becoming so abundant that they would eat up all the food and so exclude the trout that man wishes to increase. In Florida when the Plume Trade flourished and the Egrets and Pelicans were slaughtered by the thousand, it was found that the Mullet had disappeared. This fish was a rich source of food and the livelihood of many persons. After the birds were protected and began to be seen again, the fish re-appeared! Why? It is now known that the droppings of the birds, falling into the water, fertilized the plants, which are food and shelter for many small creatures, which in turn are food for the mullet. The chain of life is often upset by man, very seldom to his ultimate benefit.

BIRDS THAT EAT FLESH

Sharpshinned Hawk	Marsh Hawk	Burrowing Owl
Cooper's Hawk	Sparrow Hawk	Short-eared Owl
Red-tailed Hawk	Roadrunner	California Jay
Red-bellied Hawk	Barn Owl	Steller's Jay
White-tailed Kite	Horned Owl	Crow
Golden Eagle	Screech Owl	Shrike

In this we do not include caterpillars; these are treated as insects; but it does include such things as snakes, mice, eggs, young birds, frogs, etc., all of which are eaten by such omnivors as Crows or Jays as opportunity serves. Hawks and Owls catch and eat great numbers of rodents, creatures for which the farmer feels no affection. Many thoughtless hunters shoot all hawks and owls, little realizing that they are usually shooting a bird that is a farmer's friend. Few men with guns bother to learn one hawk from another.

BIRDS THAT ARE SCAVENGERS

Turkey Vulture	Glaucous-winged Gull	Ring-billed Gull
California Condor	Western Gull	Heermann's Gull
Bald Eagle	California Gull	Raven

In Alaska, the Bald Eagle consumes large quantities of dead fish.
In former years when the large predators, Puma and Grizzly Bear, were abundant in California, there were many deer carcasses for the Condor to eat. The lack of this food is given as one of the reasons these hugh birds now are facing extinction.
It is claimed that our beaches would be filthy, smelly places if it were not for the ever-hungry scavenger gulls.

BIRDS THAT EAT NUTS, BERRIES AND SEEDS

California Quail	California Jay	Phainopepla
Mountain Quail	Steller's Jay	Cedar Waxwing
Band-tailed Pigeon	Nutcracker, or Clark's Crow	English Sparrow
Domestic Pigeon	Mockingbird	Redwing
Mourning Dove	California Thrasher	Black-headed Grosbeak
Chinese Spotted Dove	Hermit Thrush	House Finch
California Woodpecker	Russet-backed Thrush	American Goldfinch
		Green-backed Goldfinch

Here we have the vast army of seed-eaters. Sometimes the fruit is digested and the seed passed undamaged, and so spread. Mistletoe berries are spread from tree to tree as the birds clean their beaks against the branches.
The Jays bury surplus food in the Fall. Many acorns are never found again and grow up to fine trees. It seems probable that we owe some of our finest groves, especially those growing on steep hillsides, to these noisy planters.
Fruit eaters are often a serious pest to the orchardists and special steps have to be taken in a given area; but this does not make it advisable to shoot these birds at other times. Most of them feed their young on insects and caterpillars during the nesting season and so do far more good in control of orchard insects than they harm the fruit crop.

BIRDS THAT EAT WATER-DWELLING INVERTEBRATES OR POND VEGETATION

Baldpate	Black-bellied Plover	Long-billed Dowitcher
Pintail	Snowy Plover	Avocet
Teal	Black Turnstone	Black-necked Stilt
Shoveller	Long-billed Curlew	Phalarope
Lesser Scaup Duck	Hudsonian Curlew	Long-billed Marsh Wren
Ruddy Duck	Sandpipers	Dipper
Clapper Rail	Western Willet	Yellow-throat
Coot	Greater Yellow-legs	

Ducks feed extensively on water plants. Shore birds eat the little sand crabs and "sand fleas" found between high and low tide marks. Such birds as the Yellow-throat and Marsh Wren hunt the insects on marsh plants. The Dipper, using his wings, "flies" under the surface of swift mountain streams hunting insects and their larvae.

BIRDS THAT EAT INSECTS

Birds that Hunt on the Trunks and Larger Branches of Trees

California Woodpecker	Nuttall's Woodpecker	Pygmy Nuthatch
Hairy Woodpecker	White-headed Woodpecker	Creeper
Downy Woodpecker	White-breasted Nuthatch	House Wren

Birds that Hunt among the Smaller Branches and Leaves of Trees and Shrubs

Mountain Chickadee	House Wren	Vireos
Plain Titmouse	Bewick's Wren	Warblers
Wren-tit	Blue-gray Gnatcatcher	Western Tanager
Bush-tit	Ruby-crowned Kinglet	

Birds that Hunt in the Air

Dusky Poorwill	Ash-throated Flycatcher	Olive-sided Flycatcher
Texas Nighthawk	Black Phoebe	Violet-green Swallow
White-throated Swift	Say's Phoebe	Barn Swallow
Western Kingbird	Western Wood Pewee	Cliff Swallow

Birds that Hunt in Flowers

Hummingbirds	Hooded Oriole

Birds that Hunt in Rock Crannies

Canyon Wren	Rock Wren

Birds that Hunt on the Ground

(a) under bushes and on lawns:

Red-shafted Flicker	Russet-backed Thrush	Lark Sparrow
Mockingbird	Green-tailed Towhee	Chipping Sparrow
California Thrasher	Spotted Towhee	Gambel's Sparrow
Robin	Brown Towhee	Fox Sparrow
Hermit Thrush	Oregon Junco	Song Sparrow

(b) in open fields:

Sparrow Hawk	Horned Lark	Shrike
Killdeer	Crow	Meadowlark
Long-billed Curlew	Western Bluebird	Redwing
California Gull	Mountain Bluebird	Brewer's Blackbird
Ring-billed Gull	Pipit	Dwarf Cowbird

Insects far outnumber all other living species combined. Some species are decidedly beneficial to man, but many are not. There are some famous cases where birds have been the deciding factor in the control of insect plagues. Perhaps the best known is the Mormon cricket invasion, when gulls came in great numbers to feed upon the crickets, and enough grain was saved to see the Mormons through the winter. A statue, in grateful memory of what the gulls did, now stands in the Temple grounds in Salt Lake City.

Insects abound everywhere, from beneath the surface of the water to the tops of our highest mountains. Birds have become specialists in hunting them.

SOME GENERAL NOTES ON THIS PAPER

In selecting the bird lists for this paper, two things have been borne in mind. First, the birds selected are relatively common in Southern California. Second, the novice should have little trouble identifying them in the field without field glasses, provided he has learned something of the birds' habits and distribution. For further help in identifying birds we recommend the following:

"A Field Guide to Western Birds," by Roger Tory Peterson. Price, $3.50

"A Study List of Common Birds of Los Angeles County, According to Their Habitat and General Distribution." Price, 2 cents.

For further data and examples, such as appear in this paper," see "The Practical Value of Birds," by Junius Henderson. The Macmillan Company. 1934.

A FEW HINTS ON ATTRACTING BIRDS TO THE GARDEN

Many people enjoy birds in their gardens, not only because birds destroy insects, but because of their beauty and song. Shrubs and flowers can be selected with this in mind. The Los Angeles Audubon Society has published a leaflet prepared by Theodore Payne,- "California Native Plants Desirable for Gardens and Bird Sanctuaries." Price, 5¢. It includes a few introduced plants. The kind of bird attracted by each plant is indicated.

To those who wish to provide feeding trays for thr birds, the following food is recommended: Bread-crumbs, general scratch, sunflower seeds, peanut hearts, raisins, suet, apples. These are all relished, especially in the colder months when insects are scarce.

During the hot weather a drinking fountain is very popular. It should be a shallow dish. The lid of a discarded garbage can will serve. Care should be taken to see the water is kept clean and fresh daily.

Caution: Where domestic cats are common, see that steps are taken to prevent them from reaching the birds. This can be done by hanging a small feeder on swinging chains, or putting the tray up on a tall metal pole too high for the cat to jump to. Large birds are often greedy. They drive the smaller ones away. A small tray (pie pan) hung on chains will furnish a place where small visitors can dine in peace.

Helpful source material can be obtained from the Los Angeles Audubon Society. Write or telephone Miss Clara E. Pflager, 141 N. Berendo St., Los Angeles 4; telephone, FEderal 6127.